

MATH 1251 Section 02
Calculus and Differential Equations for Biology 1

Spring 2014
9:15 am – 10:20 am, Monday, Wednesday, Thursday

4 credit hours
Behrakis 030

Instructor: Nicholas Matteo
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Nightingale 537

Course Coordinator: Samuel Blank
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Lake 535

Office Hours: MWR 10:30–11:30 in 537 Nightingale. If you can't make it to these hours, email me to arrange a convenient time. You are also welcome to visit the office hours of other instructors for this course. These are:

MWR 10:45	Samuel Blank, 535 Lake
MWR 11:45–12:45	Mark Ramras, 547 Lake
MWR 12:00–1:15	David Lang, 540A Nightingale
MWR 3:00–4:15	David Lang, 540A Nightingale
MW 5:50–7:20	David Knott, 542 Nightingale

Textbook: Calculus and Its Applications, by Goldstein, Lay, Asmar, and Schneider, 13th edition. We'll only follow the book loosely; there will also be a lot of notes on Blackboard. The 11th or 12th editions will work, if you find older copies; homework problems may be different.

Important Dates:

Monday, January 6	First day of class
Monday, January 20	Martin Luther King Jr.'s Birthday (No class)
Monday, January 27	Last day to drop without a W grade
Tuesday, January 28	Last day to file a final exam conflict form
Monday, February 17	President's Day (No class)
March 1–9	Spring Break
Tuesday, April 1	Last day to drop with a W grade
Tuesday, April 15	Last day of class
Wednesday, April 16	Reading day
April 17–25	Final exam period

MATH 1251 is the first semester of the two semester Calculus, Differential Equations, and Linear Algebra Sequence for Biology Majors. The course will roughly cover the first four or five chapters of the text as a (re)introduction to differential calculus, in order to get quickly into Differential Equations commonly used by biologists, which form the main body of the course. We cover methods to solve these equations and to obtain solutions from actual laboratory data. A considerable amount of material not in the book will be covered. There is no book yet doing what we want to do at the level we need. Goldstein *et al* is mainly there as a security blanket. Nonetheless, reading the sections we do cover – whether I mention it or not – is an excellent idea!

Prerequisites: YOU MUST KNOW HIGH SCHOOL ALGEBRA COLD! If you are weak in this area, you'll be better off in MATH 1120. If you have had no calculus at all and feel unsure about your math skills, you'll be better off in MATH 1241 (Calculus 1). I suggest reviewing Chapter 0 from the textbook.

Quizzes: There will be one quiz each week, generally on Thursdays, taking 15 minutes. There will be no make-ups. For University-excused absences (check your handbook) the missed quiz will not count against you. In that case you should notify me as soon as possible that you will miss the quiz.

Homework: Homework will be assigned in nearly every class. You are responsible for having done the problems at the end of the section discussed in the last class, even if I don't specifically assign them. Discussion of the homework will form the first part of the class.

Class participation: If I notice you asking or answering questions, I'll make a note. Participating a lot can help your grade, but you can get a good grade without participating at all. Don't feel bad about coming in late; just try not to disrupt the class. If for some reason you must leave early, please see me before class. No other early departures will be tolerated with the exception of severe medical problems. All cell phones must be turned off!

Grade: Your grade is weighted variably in your favor.

- Quizzes: 40–58%
- Final: 40–58%
- Homework and Participation: 2–20%

The combination, totaling 100, which yields the highest grade for the individual student will be used. Grades are not otherwise curved (so 90 and above is an A, 80–90 is a B, 70–80 is a C, 60–70 is a D.)

Tutoring: The Math department offers free tutoring in Nightingale 540B. Schedule appointments at <http://neumath.mywconline.com>. The tutoring center is open MTW 10–8, R 10–6, F 10–1, starting by January 21. The Peer Tutoring Center (373-2150) in Snell Library, 2nd floor, is another resource.

Calculators: A scientific calculator (ie, one with a button marked “sin”) is required. A graphing calculator is useful but not required. Use of cell phones is not permitted on quizzes or tests.

If you have concerns about the course, the first step is to contact me. If I cannot be reached or do not resolve your concern, contact the course coordinator, Samuel Blank. If the course coordinator does not settle the matter, contact the undergraduate director, Professor D. King (donking@neu.edu, 447 Lake, x5679).

Tentative Course Outline

Differential Calculus

Infinity and Beyond
Standard Parts
Smooth Graphs
The derivative
The Rules of Differentiation
Second Derivatives
Curve Plotting
The Function That is Its Own Derivative
Exponentials and Logarithms

Pharmacokinetics

How to use semilog graph paper
Zero-order and first-order processes
Processes tending toward equilibrium
Bi-exponential processes*
“Peeling” Data*
Biological Half-life

Differential Equations

First steps
Homogeneous Linear Equations with Constant Coefficients
First Order Linear Non-homogeneous Differential Equations with Constant Coefficients
Non-homogeneous Linear Equations with Constant Coefficients I (particular solutions)
Non-homogeneous Linear Equations with Constant Coefficients II (general solution)
Systems of differential equations

Compartmental Problems

Non-zero initial concentration
Two compartment series dilution
Diffusion between compartments

Tracer experiments*

Quantification of radioactivity
Inflow and outflow through cell membranes

Trigonometric Functions

Radian Measure
Sine and Cosine
Calculus of trigonometric functions

More Differential Equations

Nonhomogeneous Differential Equations with Trigonometric Right Hand Side

Linear Algebra

Gaussian Elimination
Matrix, Matrices
Singular Matrices
Determinants
Eigenvalues
Matrices and Differential Equations
Markov Processes

* optional – if time permits